

Extensions of Certain Graph-based Algorithms for Preconditioning

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Given a linear system, the original TPABLO algorithms are a collection of algorithms which compute a symmetric permutation such that the permuted system has a relatively full block diagonal with relatively large non-zero entries. This block diagonal can then be used as a preconditioner. We propose and analyze three extensions of this approach: we incorporate an unsymmetric permutation to obtain a large diagonal, we use a more general parametrization for TPABLO, and we choose the preconditioner so that it also includes certain off-diagonal blocks; we do this by computing a maximum spanning tree on the quotient graph. Since our approach allows for efficient use of BLAS3 operations, it outperforms direct solvers and standard ILU preconditioners on many test problems. It also compares favorably with other orderings used for preconditioning. Extensive numerical experiments are reported.

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